SECTION 0 – INTRODUCTION

0. TABLE OF CONTENTS

SECTION 0 – INTRODUCTION

SECTION 1 – ORGANISATION

SECTION 2 – EMERGENCY PHASES

SECTION 3 – SEARCH PLANNING

SECTION 4 – SAR FACILITIES

SECTION 5 – SAR OPERATIONS

SECTION 6 – CONCLUSION OF SAR OPERATIONS

SECTION 7 – APPENDICES

SECTION 0 – INTRODUCTION

1 FOREWORD

1.1 HISTORICAL BACKGROUND

The Search and Rescue (SAR) function is a state obligation imposed by the Convention on International Civil Aviation Organization (ICAO) Chicago, 7 December 1944.

1.2 PURPOSE AND OBJECTIVE

This manual serves as a standard operational reference document for use by the Rescue Coordination Centre (RCC) in the planning and execution of aeronautical search and rescue operations primarily within the Accra SAR Region. The RCC shall however ensure that the planning of SAR operations is not in conflict with this manual.

It must also be noted that this manual does not, on its own, provide all the information necessary for carrying out search and rescue operations but that the users of the manual shall be adequately trained to operate as competent Search and Rescue Mission Coordinators (SMCs). Reference should be made to the ICAO Annex 12, International Aeronautical and Maritime search and Rescue (IAMSAR) Manual Volumes I, II and III for more comprehensive and detailed information. The Regional Supplementary Procedures (DOC 7030) and the Ghana Aeronautical Information Publication (AIP) also complement this SAR Manual in the provision of Aeronautical Search and Rescue in the Accra SAR Region.

The objective of this manual is to provide general guidelines to personnel, organizations and agencies involved in the establishment and operations of SAR to facilitate prompt rescue response to any related emergency.

The manual is written to update The Search and Rescue Mission Coordinators (SMCs) in SAR procedures during Search and Rescue Missions.

1.3 REFERENCE DOCUMENTS

The reference documents for the SAR Manual are the following:
ICAO Annex 12, Search And Rescue
ICAO IAMSAR manual Volume I, II and III
ICAO Doc 7030, Regional Supplementary Procedures, Africa-Indian Ocean (AFI) SUPPS
Ghana Civil Aviation Regulation 12 (GCAR 12)
Ghana AIP

1.4 EFFECTIVE DATE

The effective date of this manual is stated at the foot notes of the pages.

1.5 ENQUIRES

All enquires regarding the contents of this Manual should be addressed to:

The Director
Air Traffic Services Department
Ghana Civil Aviation Authority
Private Mail Bag – K.I.A.
Accra - Ghana

1.6 APPROVAL AUTHORITY

This SAR manual is issued and signed under the authority of Director General, Ghana Civil Aviation Authority.

SECTION 0 – INTRODUCTION

2. LIST OF PUBLISHED AMENDMENTS TO THE SAR MANUAL

Change no	Amendment effective date	Amendment inserted	Amendment inserted by (signature)
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			

SECTION 0 – INTRODUCTION

3. DISTRIBUTION LIST

1. MINISTRY OF FOREIGN AFFAIRS
2. MINISTRY OF DEFENCE
3. MINISTRY OF INTERIOR
4. MINISTRY OF HEALTH
5. MINISTRY OF COMMUNICATION
6. MINISTRY OF TRANSPORT
7. MINISTRY OF LOCAL GOVERNMENT& RURAL DEV
8. NATIONAL SECURITY COORDINATOR
9. DIRECTOR-GENERAL
10. DEPUTY DIRECTOR GENERAL (T)
11. DIRECTOR AIR TRAFFIC SERVICES
12. DEPUTY DIRECTOR AIR TRAFFIC SERVICES
13. DIRECTOR SAFETY REGULATION
14. DIRECTOR LEGAL SERVICES
15. MANAGING DIRECTOR (GACL)
16. DIRECTOR AIRPORTS OPERATIONS(GACL)
17. DIRECTOR AVIATION SECURITY(GACL)
18. AIR TRAFFIC CONTROL (ATC)
19. RESCUE FIRE FIGHTING SERVICE (GACL)
20. AERONAUTICAL INFORMATION SERVICE (AIS)
21. GHANA AIR FORCE
22. GHANA NAVY
23. GHANA ARMY
24. GHANA ARMED FORCES HEADQUARTERS
25. GHANA POLICE SERVICE
26. NADMO
27. GHANA MARITIME AUTHORITY
28. GHANA NATIONAL FIRE SERVICE (GNFS)
29. GHANA PORTS AND HABOURS AUTHORITY (GPHA)
30. TOGO
31. BENIN
32. GHANA NEWS AGENCY
33. GHANA IMMIGRATION SERVICE

SECTION 0 – INTRODUCTION

4 DEFINITIONS

ALERT PHASE (ALERFA)- A situation wherein apprehension exists as to the safety of an aircraft and its occupants.

ALERTING POST - Any facility intended to serve as an intermediary between a person reporting an emergency and a rescue coordination centre or rescue sub centre.

DISTRESS PHASE (DETRESFA) - A situation wherein there is a reasonable certainty that an aircraft and its occupants are threatened by grave and imminent danger and require immediate assistance.

DITCHING - The forced landing of an aircraft on water.

EMERGENCY PHASE - A generic term meaning as the case may be, Uncertainty phase, Alert phase or Distress phase.

JOINT RESCUE COORDINATION CENTRE (JRCC) - A rescue coordination centre responsible for both aeronautical and maritime search and rescue operations.

POSSIBILITY AREA- The smallest area containing all possible survivors or search object locations which it is physically possible for the aircraft to have reached.

RESCUE - An operation to retrieve persons in distress, provide for their initial medical or other needs and deliver them to a place of safety.

RESCUE COORDINATION CENTRE (RCC) - A unit responsible for promoting efficient organization of search and rescue services and for coordinating the conduct of search and rescue operations within a search and rescue region.

RESCUE SUBCENTRE (RSC) - A unit subordinate to a rescue coordination centre established to complement the latter according to particular provisions of the responsible authorities.

SEARCH - An operation normally coordinated by a Rescue Coordination Centre or Rescue Sub-centre using available personnel and facilities to locate persons in distress.

SEARCH AND RESCUE (SAR) AIRCRAFT- An aircraft provided with specialized equipment suitable for the efficient conduct of search and rescue missions.

SEARCH AND RESCUE (SAR) MISSION COORDINATOR – The official temporarily assigned to co-ordinate response to an actual or apparent distress situation

SEARCH AND RESCUE (SAR) SERVICE - The performance of distress monitoring, communication, coordination and search and rescue functions initial assistance or medical

evacuation, through the use of public and private resources, including cooperating aircraft, vessels and other craft and installations.

SEARCH AND RESCUE REGION (SRR) - An area of defined dimensions, associated with a rescue coordination centre within which search and rescue services are provided.

SEARCH AND RESCUE UNITS (SRU) - A mobile resource composed of trained personnel and provided with equipment suitable for the expeditious conduct of search and rescue operations.

STATE OF REGISTRY - The state on whose register the aircraft is entered.

UNCERTAINTY PHASE (INCERFA) - A situation wherein uncertainty exists as to the safety of an aircraft and its occupants

VFR FLIGHT - A flight conducted in accordance with visual flight rules.

VISUAL METEOROLOGICAL CONDITIONS (VMC) - Meteorological conditions expressed in terms of visibility, distance from cloud and ceiling, equal to or better than specified minima.

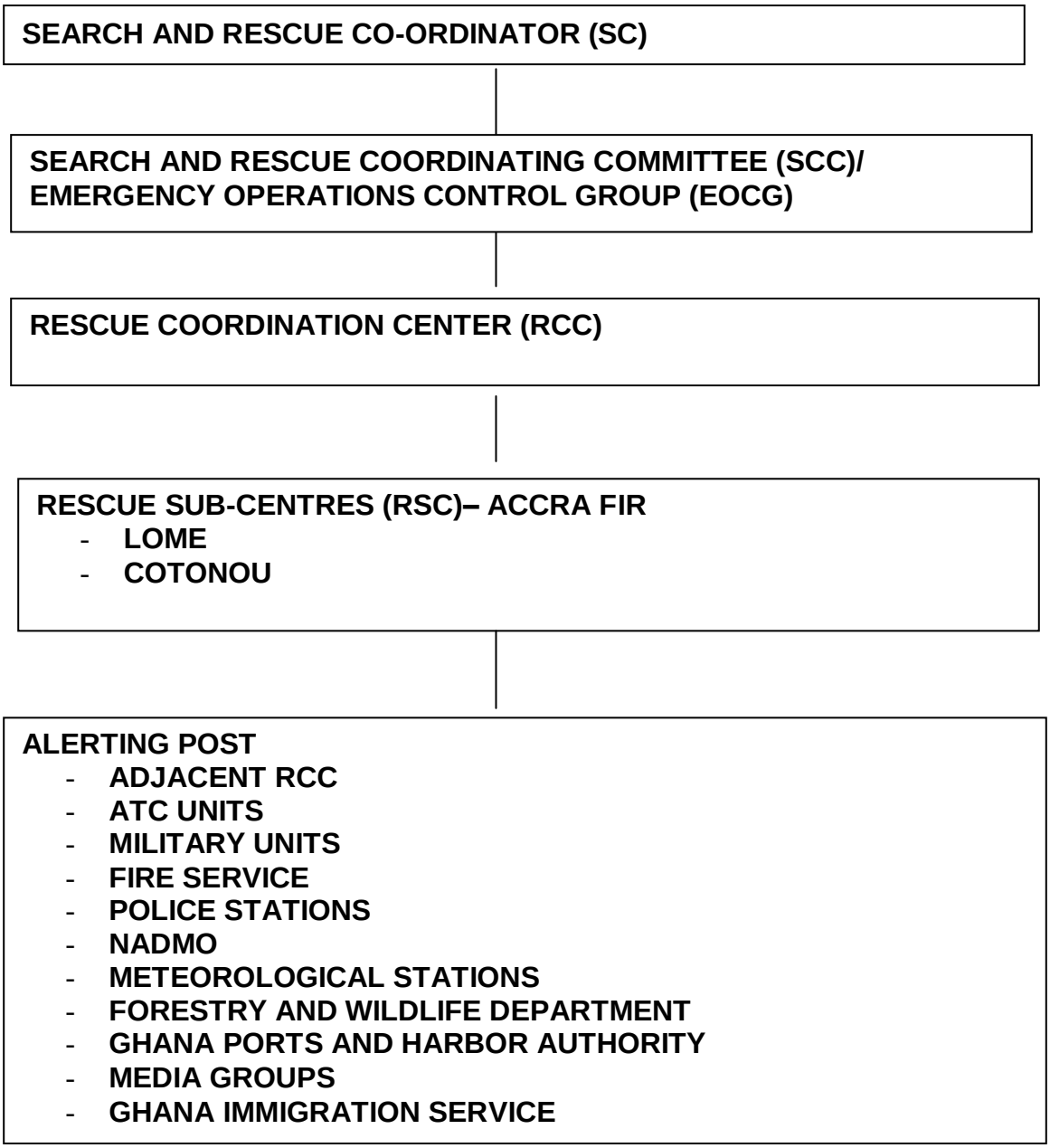
ACRONYMS

ACC:	Area Control Centre
AIP:	Aeronautical Information Publiction
ATC:	Air Traffic Control
ATS:	Air Traffic Services
ELT:	Emergency Locator Transmitters
OSC:	On-Scene coordinator
INCERFA:	The term used to designate an uncertainty phase
ALERFA:	The term used to designate an alert phase
DETRESFA:	The term used to designate a distress phase
IFR:	Instrument Flight Rules
VFR:	Visual Flight Rules
POB:	Persons on Board
COSPAS- SARSAT :	Search and Rescue Satellite aided tracking
IAMSAR:	International Aeronautical and Maritime Search and Rescue Manual (Doc 9731)

- Manual Volume I- Organization and Management
- Manual Volume II- Mission
- Manual Volume III- Facilities

SECTION 1 – ORGANISATION

1 STRUCTURE



1.1 Search and Rescue Coordinator (SC)

The administrative SAR coordinator shall be the Minister in charge of Aviation or his/her representative. The SC will define policies for smooth operations of Search and Rescue. The SC or the chairman of the Search and Rescue Coordinating Committee (SCC), shall decide on the termination of any SAR operations in the Accra Search and Rescue Region (SRR).

1.2 Search and Rescue Coordinating Committee (SCC)

The Search and Rescue Coordinating Committee (administrative function) shall be under the chairmanship of the Director General, Ghana Civil Aviation Authority. Membership of the committee shall include representatives of the Ministries of Foreign Affairs, Aviation, Defence, Health, Interior, Communications and Local government, Rural Development &Environment.

The SCC will implement policy guidelines initiated by the SC. The SCC will solicit funds from government, public and private organizations. Further the SCC will determine budget, and organize agencies or organizations which will provide resources to the SAR organization. The SCC will provide policy guideline to the Emergency Operations Control Group (EOCG). Two representatives each from Togo and Benin will serve under the SCC.

1.3 Emergency Operations Control Group (EOCG)

The EOCG is a function developed for aeronautical emergency situations within the vicinity of the aerodrome according to ICAO Annex 14. The supporting function will have representation from all the ministries operating under the SCC. The EOCG will meet any time there is an aeronautical emergency which will require assistance.

1.4 Rescue Coordination Centre (RCC)

The Ghana Civil Aviation Authority has established a Rescue Coordination Centre (RCC) adjacent to the Accra Area Control Centre (ACC). The search and rescue unit is established under GCAA Act 678 (2004) under section 3(1)K and 3(1)S.

The RCC will operate under the RCC Chief (Manager, Search& Rescue) who will ensure that the necessary resources and personnel are available at all times for SAR operations. The RCC Chief shall ensure that regular SAR exercises are organized to maintain the skill of personnel involved in SAR operations. In distress situations the RCC Chief shall appoint a SAR Mission Coordinator (SMC), who will be responsible for the planning, directing, evaluating and coordinating of SAR operations.

The Rescue Coordination Centre in conjunction with the Rescue Sub Centers (RSC) shall always be kept in a state of preparedness. The personnel attached to the respective units shall ensure that resources are available and serviceable for any SAR operations.

The RCC is responsible for search and rescue operations within the boundaries of the Accra SRR and any other areas covered in agreements between Ghana and neighboring states or between Accra FIR and adjacent FIR.

1.5 Rescue Sub-Centre (RSC)

Aeronautical Rescue Sub-Centers are established in Lome and Cotonou.

1.6 Alerting Post

Alerting Post shall include ATC, Fire Service, Police, Forestry Department, Ghana Ports and Harbours Authority (GPHA) Military units, National Disaster Management Organization (NADMO), Meteorological services and Media. The alerting post shall, coordinate distress incidents with the RCC or RSC. The RCC shall request support from organizations or agencies during SAR operations.

2. SAR AGREEMENTS

An agreement or memorandum of understanding is to be entered between Ghana and the neighboring States to ensure the maximum utilization of SAR resources and personnel in any emergency. Currently, Ghana has signed a memorandum of understanding (MOU) on Search and Rescue with Togo and Burkina Faso.

---ooo---

SECTION 2 – EMERGENCY PHASES

1. Emergency phases and action

Three phases of emergency have been established for identifying emergency situations and indicating the actions to be taken in each situation. SAR emergency phases shall be declared in respect of all types of flights in accordance with the following:

1.1 UNCERTAINTY PHASE (INCERFA)

When no communication has been received from an aircraft within a period of 30 minutes after the time a communication should have been received, or from the time an unsuccessful attempt to establish communication with such an aircraft was first made; or

When an aircraft fails to arrive within 30 minutes of the estimated time of arrival (ETA) last notified to or estimated by Air Traffic Services units, whichever is the later; except when no doubt exists as to the safety of the aircraft and its occupants

When there is a loss of radio contact within 10 minutes with aircraft arriving to or departing from an airport.

1.1.1 ACTION REQUIRED

When an uncertainty phase has been declared by the RCC or an ATS unit, the RCC shall:

Verify details notified by the alerting post. In particular the following details of the aircraft involved shall be gathered and confirmed, where possible:

- Call sign or registration
- Description: type of aircraft, colors and marking
- Passengers on board (POB) and, if available, names
- Category of operation (Visual Flight Rules (VFR) or Instrument Flight Rules (IFR)
- Pilot rating and experience
- Place of departure, destination and planned route
- Actual time of departure and estimated time of arrival
- Actual route
- Emergency equipment carried
- Last communication received
- Last known position
- Any available radar plot

- Fuel endurance and fuel expiry time
- Communication equipment
- Any dangerous cargo
- Any other relevant information

Some information may be obtained from the aircraft involved while still airborne. Further information may be obtained from flight plan, aircraft operator, owner, family and friends or from other sources. When no flight plan has been filed, attempts shall be made to obtain information from which the route and the times of departure and arrivals of the aircraft may be estimated.

Log all incoming information and progress reports and details of action taken.

Maintain close liaison with relevant ATS units, so that new information (obtained through e.g. Communication search, verification of flight plan and / or review of weather information passed to the pilot before and during the flight) will be available immediately for evaluation, plotting, decision making etc, in order to avoid duplication of actions/efforts.

Continue the communication search;

- Attempt to communicate with the aircraft involved on all appropriate frequencies either directly or through other ground or airborne units
- Determine its most probable location or route by making inquiries at all aerodromes (including the aerodrome of departure) and other locations where it might have landed or been observed; and
- Contacting other sources. e.g. aircraft known or believed to be on the same route within communication range.

When the communication search and / or other information received indicates that the aircraft is not in distress, the RCC will cancel the SAR phase and immediately inform the operator, the reporting source and any alerted facility. However, if the aircraft has not been located after extensive application of the above procedures, the SMC should consider the need to review the emergency phase.

1.2 ALERT PHASE (ALERFA)

Following the uncertainty phase subsequent attempts to establish communication with the aircraft, or inquiries to other relevant sources have failed to reveal any news of the aircraft, or

An aircraft has been cleared to land but fails to land within 5 minutes of the estimated time of landing and communication has not been re-established with the aircraft, or

When information has been received which indicates that the operating efficiency of the aircraft has been impaired but not to the extent that a forced landing is likely, or

When an aircraft is known or believed to be the subject of unlawful interference. Except when evidence exists that would allay apprehension as to the safety of the aircraft and its occupants.

1.2.1 ACTION REQUIRED

Upon the declaration of an alert phase, the RCC shall;

- Complete or initiate all relevant actions as detailed for uncertainty phase.
- Ensure that SAR Mission Coordinator (SMC) has been appointed.
- Alert appropriate SAR facilities.
- Review all information received;
- Thoroughly re-evaluate the flight plan, weather, terrain, possible communication delays, last known position, last radio communication, pilot rating and experience, estimated aircraft endurance and performance under adverse conditions.
- Maintain close liaison with relevant ATS units so that:
    - New information obtained will be made available immediately for evaluation, plotting, decision making etc; and
    - Duplication of action will be avoided.
- Request ATS Unit assistance with respect to:
    - Passing instruction/information to the aircraft in distress, aircraft reporting the distress or SAR aircraft;
    - Informing aircraft operating in the vicinity of the aircraft in distress of the nature of the emergency; and
    - Monitoring the progress of the distressed aircraft;
- Estimate and plot the probable position of the aircraft and its maximum range from its last known position.
- If appropriate, initiate search planning, and
- Whenever practicable, communicate to the operator all information received and action taken.

When information received indicates that the aircraft is not in distress, the RCC will cancel the phase and immediately inform the operator and any alerted or activated facility. However, if the aircraft has not been located after extensive application of the above procedures, the SMC should consider the need to review the emergency Phase.

1.3 DISTRESS PHASE (DETRESFA)

Following the alert phase, further unsuccessful attempts to establish communication with the aircraft and more widespread unsuccessful inquiries point to the probability that the aircraft is in distress, or

When the fuel on board is considered to be exhausted or to be insufficient to enable the aircraft to reach safety; or

When information is received which indicates that the operating efficiency of the aircraft has been impaired to the extent that a forced landing is likely; or

When information is received or it is reasonably certain that the aircraft is about to make or has made a forced landing.

Except when there is reasonable certainty that the aircraft and its occupants are not threatened by grave and imminent danger and do not require immediate assistance.

1.3.1 ACTION REQUIRED

Upon the declaration of a distress phase the RCC shall complete all relevant actions as detailed for uncertainty and Alert Phase.

From the information available, further develop a plan for the conduct of the SAR operation required and communicate such plan to the appropriate authorities /agencies. Notify relevant details of the plan to:

- The ACC, for onward transmission to the distressed aircraft (if possible) and for traffic co-ordination purposes; and
- All RCCs whose SRRs are within the aircraft maximum range as determined from its last known position.

Estimate the datum position of the distressed aircraft and evaluate the extent of the area to be searched.

Amend the plan as the operation develops.

Select and notify designated SAR units for deployment.

Request aircraft, vessels, radio stations and other facilities not specifically designated as SAR units, that are appropriate and able to assist, to:

- Maintain a listening watch for transmissions from the aircraft in distress, from survival radio equipment or from ELT;
- Assist the aircraft in distress as far as practicable
- Prepare for deployment on SAR tasks

Inform the RCC of any developments

Notify the State of Registry and operator of the aircraft.

Notify the appropriate accident investigation authority.

Maintain close liaison with relevant ATS Units so that new information obtained will be made available immediately for evaluation, plotting, decision making, etc

On request, ATS units may assist by:

- Passing instruction / information to the aircraft in distress, aircraft reporting the distress or SAR units;
- Informing aircraft (operating in the vicinity of the aircraft in distress) of the nature of the emergency and
- Notify the operator and keep them informed of developments.

1.4 RESCUE SUB-CENTRES ACTION ON DISTRESS CALL

Plot the last known position (LKP) of the aircraft on a chart or map

Advise the pilot of the nearest aerodrome if the aircraft's position is known;

Alert ATS units and obtain continuous fixes or bearings, plotting the same to determine aircraft track.

Notify Accra Area Control Center giving full details. Accra Area Control Center alerts aerodromes adjacent to the aircraft track and alerting the safety services in the vicinity of the distress aircraft

Alerts Rescue Co-ordination Center (RCC)

Inform the operator or his representative, if available.

SECTION 3 – SEARCH PLANNING

1. DETERMINATION OF SEARCH AREAS

The many diverse criteria involved in estimating the likely location(s) and condition(s) of the survivors make it impossible to give detailed, step-by-step instructions on how to make such estimates. Sound judgment and careful analysis of all available clues required to produce a valid assessment on which to base a search.

1.1 GENERAL

Search Planning involves the following steps:

- Evaluating the situation, including the results of any previous searching;
- Estimating the distress incident location and probable error of that location;
- Estimating the survivor's post-distress movements and probable error of that estimate;

Using these results to estimate the most probable location (datum) of survivors and the uncertainty (probable error of position) about that location;

Determining the best way to use available search facilities so the chances of finding survivors are maximized (optional search effort allocation);

Defining search sub-areas and search patterns for assignment to specific search facilities;

Providing a search action plan that includes a current description of the situation, search object description(s) specific search responsibilities to search facilities, on-scene co-ordination instructions and search facility reporting requirement.

These steps are repeated until either the survivors are located or evaluation of the situation shows that further searching would be futile

The following shall be considered for their possible effect on the probability area:

Errors in navigation by missing aircraft;

Drift (if applicable) to include currents and wind effect;

Last known position;

Weather in the area;

Elapsed time from last known position;

Aircraft endurance;

Known hazards along aircraft route

1.2 THE POSSIBILITY AREA

The possibility area is displayed as circle drawn round the last known position of the aircraft. The radius is determined by the endurance at that time, expressed in terms of distance and taking into account the wind velocity. It is assumed that the aircraft may have proceeded in any direction, even opposite to that of the flight plan, until the fuel was exhausted.

Determination of the possibility area will enable the SMC to filter incoming reports to identify those geographically irrelevant.

1.3 THE PROBABILITY AREA

Systematic search of a large area is normally not practicable, and concentrating the search in the area where the search object is most likely to be located (the probability area) will make better use of the search Units available.

Unless the position of the aircraft in distress is accurately known, the most probable location of the missing aircraft shall be calculated. This location, corrected for surface movements over time, is known as datum.

Determination of probability area is based on the navigational accuracy of the last known position of the aircraft. For positions reported as navigation fixes, the fix errors listed below can be assumed for SAR purposes;
Radar: 18 km (1NM)
INS: 0.9 km (0.5 NM)
OMEGA: 7.5 km (4NM)
LORANC 1.8 km (1NM) and
VOR/DME: +/- 5^0 ARC and +/- 0.9 km (0.5 NM) or 3% of distance to the antenna, whichever greater.

If the means of navigation of the distressed aircraft are unknown, the SMC shall apply error factors as follows:
Aircraft with more than two engines: 9KM (5NM)
Twin-engine aircraft: 18.5KM (10 NM); and
Single-engine aircraft: 28km (15nm)

When the reported position is based on dead reckoning (DR), and additional error factor shall be applied consistent with the distance traveled since the last fix.
Aircraft with more than two engines: 5% of the DR distance;
Twin-engine aircraft: 10% of the DR distance;
Single-engine aircraft: 15% of the DR distance.

1.3.1 APPROXIMATE POSITION AT TIME OF LANDING OR DITCHING IS KNOWN

When the approximate position of a distress scene is known, (e.g. witnessed or reported by radar, another aircraft or the distressed aircraft itself) or can be estimated with reasonable accuracy, the radius of the most probable area will be small. If there is more uncertainty about the position, the radius must be of the search target in the area to be searched. Except when executing a sector search, the area shall be squared off.

The search radius R is the radius of a circle centered on the datum. The initial Value of R is determined by the SMC on the basis of the parameters of the SAR operation (Search environment, accuracy of the approximate position) If the first search of the area is unsuccessful, the search area will have to be expanded in stages. The search radius is normally called R_1 for the first search; R_2 for the second, etc. (see Illustration 1 – probability area – radii expanded in stages). R_n is computed by multiplying R_{n-1} by the appropriate safety factor F as follows.

$R_2 = R_1 \text{ X } F_2$

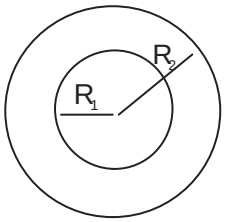


Illustration 1: probability area – radii expanded in stages

The Safety factor is determined as follows:

Search Number	Safety Factor
1	1.1
2	1.6
3	2.0
4	2.3
5	2.5
Subsequent Searches	2.5

When a search area is extended or additional area must be searched, more search units will be required or the track spacing will have to be increased unless of the duration of the search is permissible.

1.3.2 ONLY REPORTED TIME OF CRASH, FORCE LANDING OR DITCHING IS KNOWN

If an accident occurs between two reporting points, the approximate position of the accident may be calculated from navigational data derived from the flight plan.
The probability area is determined as follows:
Draw a circle with a radius R (e.g. 18,5 km (10NM) around the last reported position.
Draw a circle around the next reported point with a radius of R plus 10% of the distance between the two points; and draw straight lines tangential to the circles.

The datum area will be centered on the probable location of the aircraft based on the reported time of crash. (Illustration 2-Probability area-accident between reporting points).
$R_2 = R_1 + 0.1 \text{ X } D$

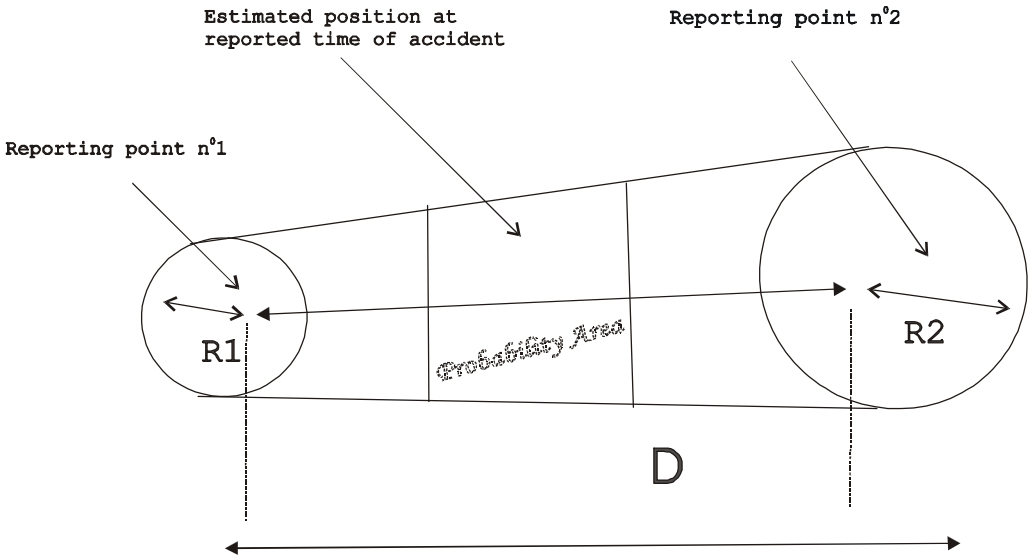
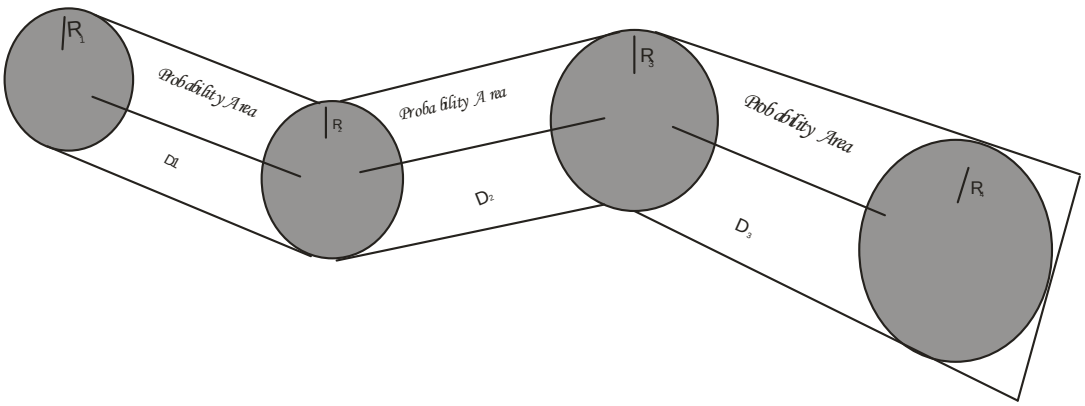


Illustration 2. Probability area - accident between two reporting points

1.3.3 ONLY THE PLANNED ROUTE IS KNOWN

When can aircraft disappears en-route, the first theory is that the aircraft is located on or near the intended track, or that it has experienced a communication failure and is proceeding in accordance with the flight plan. In this case, the search will be confined to the immediate vicinity of the track.

Probability area No 1-Draw a circle around the next reporting point with a radius of 18.5km (10NM) plus 10 per cent of the distance between the two points. Continue in the same way along the route to the destination and square off both ends.



$R_2 = R_1$ X 10% D_1
$R_3 = R_2$ X 10% D_2
Rn = Rn-1 X 10% Dn-1

Illustration 3. Search area – accident somewhere in between several expected reporting points.

In the above example, the first area (radius R_1) drawn around the last reported position or the aerodrome of departure and the fourth area drawn around the destination aerodrome. The Probability area is the area enclosed by the tangents to the circles whose radii are R_1 to R4.

Probability area No.2- If the area described in the previous paragraph is searched without locating the missing aircraft, an expanded area shall be plotted in the same manner as before except that the radii of the circles shall be progressively increased and the area therefore expanded.

$R_1 = R_1 X \ f$ where f=20% for example and
Rn = Rn-1 X 15% Dn_{-1}

1.3.4 OTHER INFORMATION RECEIVED

When the last communication received from an aircraft is not a position report but some other communication which did not indicate a distress, the probability area would be centered on the probable position of the aircraft based on the time of its last transmission. In such a situation, it will not be known whether the pilot has elected to continue, divert or turn back. Consequently, there could now be various subsequent areas of priority for search.

1.3.5 ADJUSTMENT OF THE PROBABILITY AREA GENERAL

While the search is in progress, all information received must be given careful consideration. Some of the factors that must be taken into account are:

- Serviceability of ground navigation aids and airborne equipment:
- Meteorological conditions;
- Nature of terrain;
- Pilot training and / or habits; and
- Life raft and / or parachute drift; etc

These factors may influence modification of the probability area.

1.4 METEOROLOGICAL CONDITIONS

In adverse weather conditions, some meteorological factors may be of particular influence in determining the pilot's probable actions. Some of these factors shall be considered.

- Deviation in wind velocities from the forecast;
- Areas of low cloud or reduced visibility;
- Marked variation in barometric pressure;
- Thunderstorm activity;
- Severe turbulence;
- Icing; and
- Weather conditions at the last known position and along the intended route to the destination (AIREPs,Special AIREPs, regular weather observations, reports from reliable local sources)
- Meteorological briefing given to the pilot; and
- Any disparity between the forecast and actual weather en-route

1.4.1 THE NATURE OF TERRAIN

A map, given sufficient details of the area where the aircraft has disappeared, shall be studied carefully to determine the pilot's possible course of action. A very high mountain or mountain range close to its intended track shall be given a high priority for search, particularly in adverse weather conditions. On the other hand, a pilot encountering adverse weather may choose to avoid high terrains and attempt to follow valleys or proceed towards

low terrain. When the terrain over which the aircraft is proceeding is too rough for an emergency landing, a pilot may head for an area where a landing would be less hazardous.

1.5 THE PILOTS KNOWN RECORD AND HABITS

The pilot's experience, local knowledge and stated opinions shall be assessed in determining his/her possible actions in an emergency. The opinions of the pilot's colleagues may also prove useful.

1.6 COMPANY PRACTICES AND PROCEDURES

The views of the owner/operator shall be obtained, as company practices and procedures may provide indications as to the probable actions of the pilot.

SECTION 4 – SAR FACILITIES

1 SAR UNITS

1.1 Airborne units

Operator	Type	Base	Range	Cruise Speed (Kts)	Specialized Equipment	Response Time	Weather Condition	others
Ghana Air Force	F27	Accra	1200 nm	240	Direction Finder	1HR		
	K8	Accra	1375 nm	450		1HR		
	M17	Accra	750 nm	250	Winch	1HR		
	C172	Takoradi	330 nm	100		1 HR		
	BN2T	Takoradi	600 nm	150		1 HR		

1.2 Maritime units

Operator	Type	Base	Range	Specialized Equipment	Response Time	Weather Condition	others
Ghana Navy	Ships Speed-boats	Tema Takoradi		Divers	1 HR		
Ghana ports and harbors	Tugboats Speed-boats	Tema Takoradi		Divers	1 HR		

1.3 Land units

Police
Personnel, communication facilities, cordon/secure accident area, control crowds, direct and regulate traffic

Fire and Rescue Services
Personnel and equipment during the search operation and for fire fighting, communication facilities,

Medical Services, Ministry of Health
Provide ambulances and personnel, determine triage service

Army
Provide search vehicle, personnel and equipment (maps, tents, binocular, etc), communication facilities

Forestry Department
Provide search personnel

NADMO
Provide logistic; tents, blankets, food and survival packages

Local volunteer Organization
Provide updated information about local conditions (terrain, etc)

District Assemblies
Mobilize local resources, assist in collection, collation and dissemination of information

FM stations
Broadcast requests from ARCC about missing aircraft. The idea is to describe the missing aircraft and provide the public with the telephone-number to the ARCC.

SECTION 5 – SAR OPERATIONS

CHAPTER 1 OPERATIONS

1.1 GENERAL

The primary purpose of rescue is the expeditious removal to safety of the survivors of a distress situation. The following list provides an overview of the steps involved in rescue planning and Implementation.

- Assess the rescue requirements of the distress situation.
- Determine the rescue unit based on the requirements of the case and available assets.
- Plan (including a contingency Plan) and implement the rescue.
- Monitor the rescue units and facilities until all survivors have reached a place of safety.
- Provide further assistance to the rescue assets and facilities as required.

1.1.2 REQUIREMENTS

The initial assessment of the requirements commences at the onset of a search and rescue incident and continues until all survivors have reached safety. Re-assessment of the rescue requirements will occur throughout the incident and will be based on the following information as it becomes available:

- Action taken by the sighting unit
- Location of survivors
- Number of persons
- Condition of survivors and Medicare considerations
- Possible movement of survivors
- Available assets
- The need for life sustaining equipment to be provided to survivors until the rescue can be executed.
- Environmental considerations
- Effect of the weather
- Time of Day
- Risk to search and rescue personnel due to hazardous material and hazardous environmental conditions, e.g. weather, terrain, time of day.
- Support method available pending arrival of rescue assets, e.g. dropping of supplies.

1.1.3 RESCUE ON LAND

Based on the assessment of the rescue requirements and the available assets identified, the SMC will determine the most appropriate unit based on the following considerations:

- Urgency of the rescue situation
- Ability to provide life supporting assets until the rescue is completed
- Time of day and its implications for an air rescue
- Medical advice concerning rescue methods
- Land and air units available and their suitability for the task
- Weather conditions
- Potential risk to rescue units

1.1.4 RESCUE ON WATERS

Based on the assessment of the rescue requirements and the available assets identified, the SMC will determine the most appropriate rescue unit, considerations for maritime and inland water rescue are:

- All of the list above
- Distance from land and its implication for available rescue assets
- Surface assets available and their suitability for the task at hand

1.5 BRIEFING

Task the most suitable rescue units based on the rescue requirements and provide such rescue units with a briefing including the following information as a minimum:

- Location of survivors,
- Communication available en-route and on scene;
- Weather on scene
- Nature of the task
- Return location for survivors
- Condition of survivors (if known)
- Specialized medical treatment required (if known)

Coordinate with appropriate authorities for survivor transfer and any post-incident/accident requirements. Arrange logistics to support rescue units. The following are common support requirements for rescue units:

- Equipment
- Communications
- Top-cover Aircraft
- Medical Assistance
- Fuel
- Accommodation
- Food
- Consideration of relief crew
- Consider standby-resources
- Display rescue units in the RCC
- Display the unit information on boards including
- Call sign;
- Type of aircraft
- Equipment carried on board
- Estimated time of arrival on scene

1.6 MONITORING THE RESCUE

Once the rescue units have commenced their task, their progress is monitored to ensure a successful outcome. Monitoring the rescue may involve;

- Maintaining communication with each rescue unit (where possible).
- Assisting communication between rescue units and survivors through appropriate means.
- Continuing the search for missing survivors, if all persons on board are not accounted.
- Continuing coordination with appropriate authorities by providing situation updates.
- Providing assistance to external search and rescue authorities as requested.
- Maintaining communication with stand-by resources to ensure continued availability and state of readiness.

CHAPTER 2 COMMUNICATIONS

2.1 GENERAL

Good Communications are essential to the success of SAR operations. A discrete frequency on 123.1MHz has been established to disseminate information between RCC and SRU during SAR operations.

A rescue sub center (RSC) established on permanent basis will be equipped with communication facilities to meet SAR requirements. Whenever a temporary RSC is envisaged considerations will be given to the availability of communication facilities essential for rapid and reliable contacts with;

- RCC
- ATS Units
- Meteorological Units
- SRUS

2.2 FIXED NETWORKS

The most rapid and reliable point to point communication is the Aeronautical fixed Telecommunication Network (AFTN), together with SATCOM and Telefax.

Ghana Armed Forces, Police, Fire Service and FM stations shall augment the communication facilities for an effective SAR operations.

2.3 AIR GROUND COMMUNICATIONS

The frequencies to effect communication among RCC, ATS units and SRUS are mainly VHF and/or HF channels. The discrete VHF frequency for SAR operations is 123.1 MHZ. Where more than one aircraft are involved in SAR, the aircraft at the higher altitude will be designated as on scene coordinator who will then relay all information to the RCC.

2.4 DISTRESS FREQUENCIES

Communication between fixed and mobile stations engaged in coordinated SAR operations may be effected on HF 5493, 6586, 8903 and 13294 KHZ.

The International Survival Craft frequencies fitted to all Emergency Locator Transmitter (ELT) carried on aircraft are 243 MHZ and 121.5 MHZ. These frequencies are monitored by aircraft and can be used for transmission during distress situations.

From 1 February 2009 the COSPAS/SARSAT satellite system designed to receive distress signals will only distribute distress signals from 406 MHZ.

CHAPTER 3 DELEGATION

3.1 RESCUE SUB-CENTERS

The RCC may delegate some or all of its responsibilities to an RSC, including communications, search planning and arrangements for SAR facilities. In that regard, the RSCs in Lome and Cotonou have been assigned SAR responsibilities in Togo and Benin respectively.

3.2 ON-SCENE COORDINATION

In some situations, the RCC may delegate some of its responsibility to an on-scene coordinator (OSC). The function of the OSC is to provide co-ordination at the scene and to carry out the RCC plan to locate and rescue survivors.

Task that may be assigned include:

- Coordinate operations of all SAR facilities on-scene and ensure that operations are conducted safely.
- Brief and debrief search crews.
- Modify the search action or rescue action plan as the situation on scene dictates, keeping the SMC advised (do in consultation with the SMC when practicable).
- Where possible, ensure fresh observers are allocated to aircraft conducting more than one sortie.
- Co-ordinate on-scene communications
- Report the number and names of survivors to the SMC
- Liaise with local authorities
- Make periodic situation reports (SITREPs) to the SMC.

The standard SITREP format shall include but not be limited to:

- Weather and sea conditions
- The results of search to date
- Any actions taken
- Any future plans or recommendations
- Status of local resources such as aircraft, fuel, crew and observers

SECTION 6 – CONCLUSION

CHAPTER 1 TERMINATION OF SAR OPERATIONS:

SAR operations enter the conclusion stage when:

- Information is received that the aircraft which is the subject of the SAR incident is no longer in distress;
- The aircraft or persons for whom SAR facilities are searching have been located and the survivors rescued; or
- During the Distress Phase, the SC or SCC determines that further search has no significant chance of succeeding.

Prior to suspending search operations, a thorough case review shall be made. The decision to suspend operations shall be based on an evaluation of the probability that there were survivors from the initial incident, the probability of survival after the incident, the probability that any survivors were within the computed search area, and the effectiveness of the search effort.

The reasons for search suspension shall be clearly recorded. The case review shall also examine:
- Search decisions for proper assumptions and reasonable planning scenarios;
- Certainty of initial position and any drift factors used in determining search area;
- Significant clues and leads re-evaluated;
- Data Computations;

The search plan has to ensure that all assigned areas were searched and the probability of detection is as high as desired; and
- Compensation was made for search degradation caused by weather, navigationa,l mechanical, or other difficulties; and
- The determination about the survivability of survivors, considering;
    - Time elapsed since the incident;
    - Environmental condition;
    - Age, experience and physical condition of potential survivors;
    - Survival equipment available and;
    - Studies or information relating to survival in similar situations.

A search shall normally be terminated only when there is no longer any reasonable hope of rescuing survivors from the SAR incident. Considerations for suspending a search include:

- All assigned areas have been thoroughly searched;
- All reasonable probable locations have been investigated
- All reasonable means of obtaining information about the whereabouts of the aircraft or persons who are the subject of the search have been exhausted, and
- All assumptions and calculations used in search planning have been reviewed.

When a SAR case is closed or search efforts are suspended, every authority, centre, service or, facility activated shall be notified. This is normally done via radio or telephone, and then followed by a final report from the RCC.

CHAPTER 2 RECORDS AND REPORTS

A record of SAR operations is required to improve methods, evaluate mistakes, if any, and provide statistics for the appropriate authority to justify SAR system support and for any subsequent investigation. This record shall include all information gathered during the operation. If the SAR service maintains computer files of SAR cases, appropriate information from this case file shall be extracted and entered into the database for future analysis.

All information pertaining to a specific SAR incident shall be placed in an easily identified and labeled file folder and then placed in storage. This folder will comprise a final report whose format shall be as follows:

- Final report number
- Date and time
- RCC
- Aircraft registration, type and call sign
- Aircraft operator
- POB
- Narrative (description of incident)
- RCC actions (operations conducted by RCC)
- SAR units – identity, time alerted, time on task, time released, time returned
- Other organizations
- Result of operation
- Number of persons – rescued, deceased, missing
- Any other information

SECTION 7 – APPENDICES

APPENDIX A

CHECKLIST FOR RCC

START LOGGING

1. INTERVIEW

- NAME AND TELEPHONE NUMBER OF CALLER
- POINT OF DEPARTURE AND DESTINATION OF AIRCRAFT
- ETA AT DESTINATION

2. FACT FINDING

- TYPE, CALLSIGN AND COLOUR OF AIRCRAFT
- ENDURANCE AND POB OF AIRCRAFT
- LAST KNOWN POSTION (LKP)
- CHECK WITH OTHER AIRCRAFT TO MONITOR ON 121.5 MHZ FOR INFORMATION
- CHECK FOR COSPAS – SARSAT MESSAGE
- CHECK FROM POLICE OR THE ELECTRONIC MEDIA
- REQUEST FROM TOWER, AREA CONTROL CENTRE, OTHER ATS UNITS AND ADJACENT RCC
- REQUEST FOR FULL FLIGHT PLAN TO CHECK ON DANGEROUS GOODS, EMERGENCY EQUIPMENT, ETC.
- CHECK ON WEATHER AT DESTINATION AERODROME AND ENROUTE
- TERRAIN

3. ACTIVATE RCC/DECIDE EMERGENCY PHASE

- EVALUATE / ANALYZE INFORMATION
- MISSION GOAL OR OBJECTIVE
- DECIDE THE POSSIBILITY AREA, SEARCH AREA, SEARCH SUB AREA
- PLAN THE SEARCH
- INFORM THE OPERATOR
- COORDINATE WITH OTHER ORGANIZATIONS
- INFORM MANAGEMENT
- ALERT SEARCH AND RESCUE UNITS (SRUS)
- SELECT SAR FREQUENCY
- ALERT TOWER, AREA CONTROL CENTRE &OTHER ATS UNITS
- ACTIVATE EMERGENCY OPERATIONS CENTRE

APPENDIX B

SAR INDEX

GHANA AIR FORCE-	777510 (OPS.), 777893 (HQ), 777410
37 MILITARY HOSP -	777595
GHANA POLICE SERVICE-	191 / 777592
GHANA NAVY-	777991/FAX 761390/776653
NADMO TELE/FAX-	772926
AVIANCE-	768839
GHANA ARMED FORCES-	668991
ST. JOHNS AMBULANCE-	241621
GHANA RED CROSS-	663756
AVIATION CLINIC-	1262
POSTS & HARBOURS AUT.-	022 202631 – 9
- FAX	022 204136
MET-	1370
VALCO (Volta Aluminum Comp)	022 204263
IFALPA REP.-	401358
AMVER (U.S.A)-	0012126687684
ABIDJAN (DIAP)	00225221276439
LUANDA (FNLU)	0024422351027
OUAGADOUGO (DFFD)-	0022650311641
NIAMEY (DRRN)-	0022720733586
LAGOS (DNMM)-	0023414733997
LIBREVILLE (FOOL)-	00241733114
-	00241733104
LOME (DXXX)-	00228 2265235 (FAX)/002282265062 (TEL)
COTONOU-	00229 21300839 (FAX)/0022921307635 (TEL)
ATNS (Aviation Training Academy)	002711 3953347 (FAX)
TOR (Tema Oil Refinery)-	022 304095
National Ambulance Service-	044605040/0287020193
	687862/687804
GHANA RED CROSS-	663756
GABORONE-	002673959440
WIND HOEK-	00264627024902
SPMCC (FAX)-	0034928727107
GNFS (National Fire Service)	772446/779635
MIN. OF AVIATION-	662626
ARMY-	772768/777849
LUFTHANSA	243896
AIS TELEFAX-	770329
GMA-	1370(METEO)
KUMASI (DGSI)-	051 22957
TAMALE (DGLE)-	071 91253
SUNYANI (DGSN)-	061 23263
TAKORADI (DGTK)-	031 24543

APPENDIX C

SEARCH AND RESCUE SITUATION REPORTS (SITREPS) FORM

SAR SITUATION REPORT NR _____
Date / time

TRANSMISSION PRIORITY

FROM

TO

SAR SITREP NUMBER

IDENTITY OF CASUALTY

POSITION

SITUATION

NUMBER OF PERSONS AT RISK

ASSISTANCE REQUIRED

CO-ORDINATING RCC

DESCRIPTION OF CASUALTY

WEATHER ON-SCENE

INITIAL ACTIONS TAKEN

SEARCH AREA

CO-ORDINATING INSTRUCTIONS

FUTURE PLANS

ADDITIONAL INFORMATION / CONCLUSION